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TECHNICAL MANUAL FOR THE

OMRON L7 VARISPEED FLUX VECTOR INVERTER

(For closed/open loop operation with Interflite and Skycom Software Control)

THIS MANUAL APPLIES TO SYSTEMS MANUFACTURED BY INTERNATIONAL LIFT EQUIPMENT AFTER 1st SEPTEMBER 2003

Issue No. 1

WE RESERVE THE RIGHT TO ALTER WITHOUT GIVING PRIOR NOTICE TECHNICAL DATA, DIMENSIONS AND WEIGHTS DESCRIBED IN THIS MANUAL

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SECTION A

Introduction

The ILE Flux Vector Control inverter for squirrel cage motors utilises state of the art electronics, to control an AC Induction Motor's speed and torque, full current vector control based on advanced control logic can be achieved. In a lift application without the need of a speed feedback element up to 0.99 m/s, and utilising encoder feedback from 1.0 m/s and above.

An accurate motor model is calculated from measurements of the motor voltage and motor current.

THEREFORE WITH BOTH OPEN LOOP VECTOR AND CLOSED LOOP FLUX VECTOR OPERATION, A NON-ROTATING TUNING RUN MUST BE PERFORMED. (SEE SECTION F)

The system enhances single speed lifts with variable speed performance for new and existing lifts, whilst decreasing wasteful heat loss within the motor typical of Variable Voltage Thyristor Controlled regulator systems.

This manual will hopefully give a summarised version of the Omron control options and assist in setting up.
Further, more detailed, information is available in the Omron L7 Varispeed user manual. We suggest that, for a first time user, the information contained in this document is studied.

SECTION B

Sequence of Events

Starting

Starting is initiated by the receipt of either an UP or a DOWN direction signal. The direction relays also energise the STR relay which connects the drive internal 24v supply to the selected drive inputs S1-S7 and BB. The drive now has speed and direction signals which results in M3-M4 Travel O/P (H2-02=41) contacts closing energising the MC+MC1 contactors. Parameter S1-06 sets the delay before contacts M1-M2 Brake O/P (H2-01=40) close energising BKC which lifts the electro-mechanical brake, this gives feedback to the processor via the STR input which signifies that the lift is moving. The speed curve is started after the time S1-04 DC injection time at start and the lift accelerates to target speed. The above sequence is designed to give a smooth start by allowing the brake to fully lift before starting the journey. The fault output MB-MC is opened when there is a fault condition in the inverter, this prevents travel taking place.

Stopping

Consider the lift is travelling at high speed. On receipt of a slowing signal the high speed signal is removed from the drive. The lift decelerates, and targets levelling speed under the influence of the deceleration and S curve parameters until levelling speed is achieved. Upon reaching the stopping zone, MSU and MSD operate, this removes all speed signals and the lift targets zero. The following sequence then occurs: -

a) When zero speed is reached the delay before the brake is released via contacts M1-M2 is set by time S1-07 brake release time, the drive keeps zero speed control, the duration is set via S1-05 DC inj time @ stop, and the journey is completed.

b) The STR relay drops after the brake is released via a timer in Skycom called stop time, this cuts off the transistors in the inverter via terminal BB which is configured as a baseblock

c) The drive output contactor releases after a time period set by S1-19, this opens M3-M4 contact which releases MC-MC1 removing the 3 phase from the motor. A time delayed safety back-up STR contact is also situated in the MC-MC1 line and this will release 2 seconds after direction is cancelled. The above delays allow the current on both the contactor contacts and regulator transistors to decay to zero before switching. This sequence of events allows a smooth stop and prolongs both contactor and transistor life expectancy.

SECTION C

Input and output connections

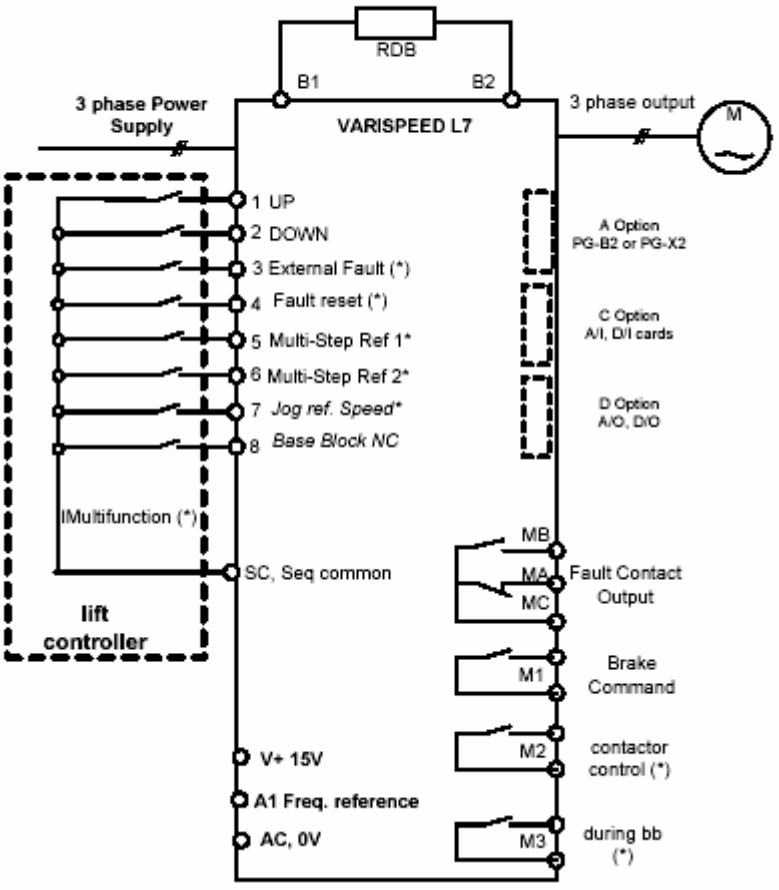
The following is a list of the inverter inputs: -

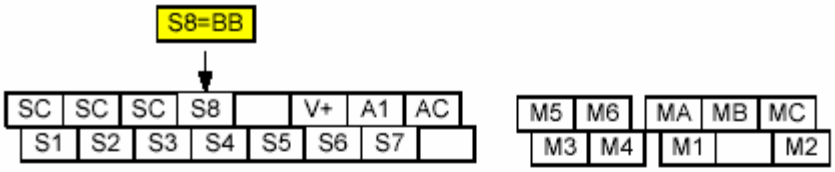
Terminal No.	Description for Interflite and Skycom
S1	Up enable
S2	Down enable
S3	Nominal speed
S4	Inspection speed (Test)
S5	Not used
S6	Levelling speed
S7	Contactor feedback
BB	Baseblock
SC	Is the 24v supply common from the drive which is switched via relays to the signal I/Ps listed above.

The following is a list of output terminals:-

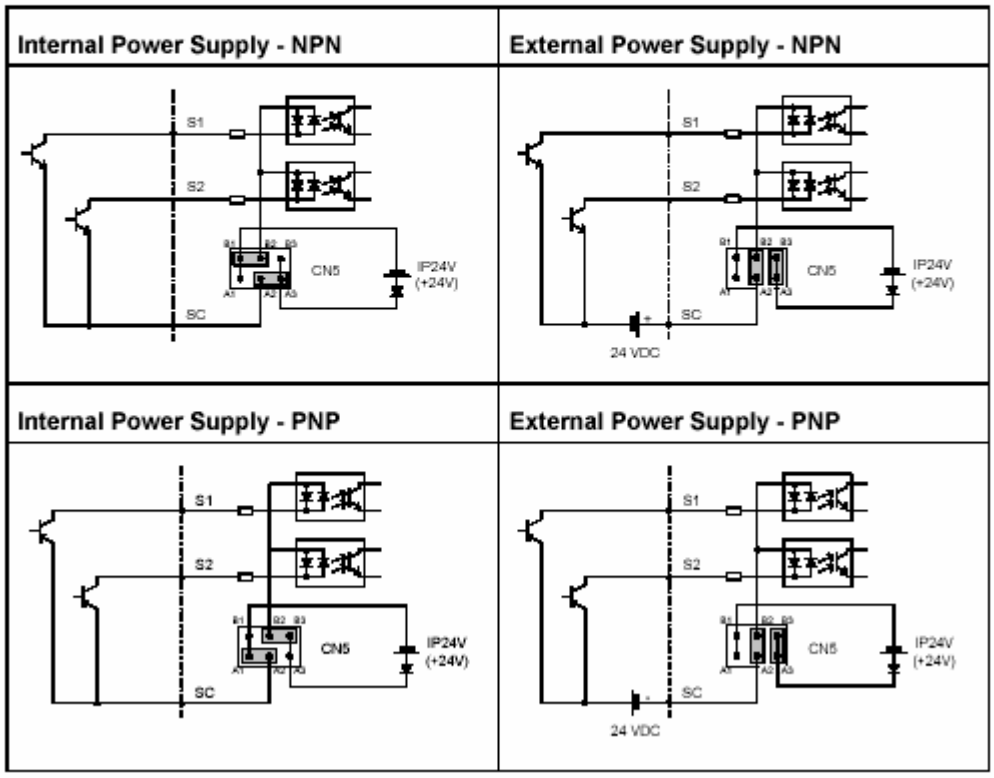
Terminal No.	Description for Interflite and Skycom
M1-M2	Energises BKC contactor to operate Electro-Mechanical brake
M3-M4	Energises MC-MC1 contactors connecting the motor.
M5-M6	Level contacts for door opening configured via S1-27, for ADO set to 4HZ, for none advance door opening set to 0HZ

Wiring, Terminals:





Digital Input Selection npn / pnp



SECTION D

Digital Operator Display

The key names and functions of the Digital Operator are described below.

Drive Status Indicators

FWD: Lights up when a forward run command is input.
REV: Lights up when a reverse run command is input.
SEQ: Lights up when any other run command source than the digital operator is selected
REF: Lights up when any other frequency reference source than the digital operator is selected
ALARM: Lights up when an error or alarm has occurred.

Data Display

Displays monitor data, parameter numbers, and settings.

Mode Display (displayed at the upper left of data display)

DRIVE: Lights up in Drive Mode.
QUICK: Lights up in Quick Programming Mode.
ADV: Lights up in Advanced Programming Mode.
VERIFY: Lights up in Verify Mode.
A. TUNE: Lights up in Autotuning Mode.

Keys

Execute operations such as setting parameters, monitoring, jogging, and autotuning.

Digital Operator Component Names and Functions

Control panel

The removable keypad is the device used for controlling and programming the Omron L7 Varispeed drive. The control panel has 11 keys and the display has 5 lines. The Control Panel can be attached directly to the inverter or it can be mounted externally. To change a parameter enter the group the parameter you wish to change is in, then move to the desired parameter and press the enter key, the far left hand unit will flash and by pressing the reset key you can move along the units to the one you wish to change the value of, then by using the arrow keys the value can be adjusted to the new value required, then press the enter button again to enter the new value and entry accepted will be displayed.

Digital Operator Keys

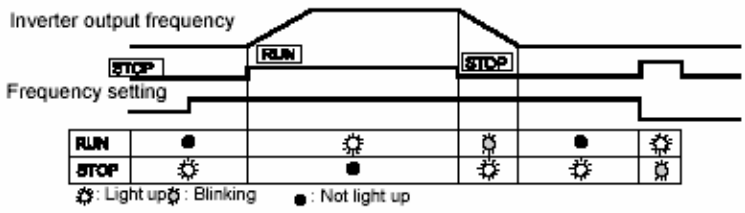
The names and functions of the Digital Operator Keys are described below

Key Functions

Key	Name	Function
MENU	MENU Key	Selects modes.
ESC	ESC Key	Returns to the status before the DATA/ENTER key was pressed.
RESET	Shift/RESET Key	Sets the active digit when programming parameters. Also acts as the Reset key when a fault has occurred.
	Increment Key	Selects menu items, sets parameter numbers, and increments set values. Used to move to the next item or data.
	Decrement Key	Selects menu items, sets parameter numbers, and decrements set values. Used to move to the previous item or data.
	DATA/ENTER Key	Pressed to enter menu items, parameters, and set values. Also used to switch from one screen to another.
RUN	RUN Key	Starts the Inverter operation when the Inverter is being controlled by the Digital Operator.

There are indicators on the upper left of the RUN and STOP keys on the Digital Operator. These indicators will light and flash to indicate operating status.

The RUN key indicator will flash and the STOP key indicator will light during initial excitation or DC braking. The relationship between the indicators on the RUN and STOP keys and the Inverter status is shown below



RUN and STOP Indicators

Inverter Modes

The Inverter's parameters and monitoring functions are organized in five groups that make it easier to read and adjust parameters.

The 5 modes and their primary functions are shown in the Table below

Table Modes

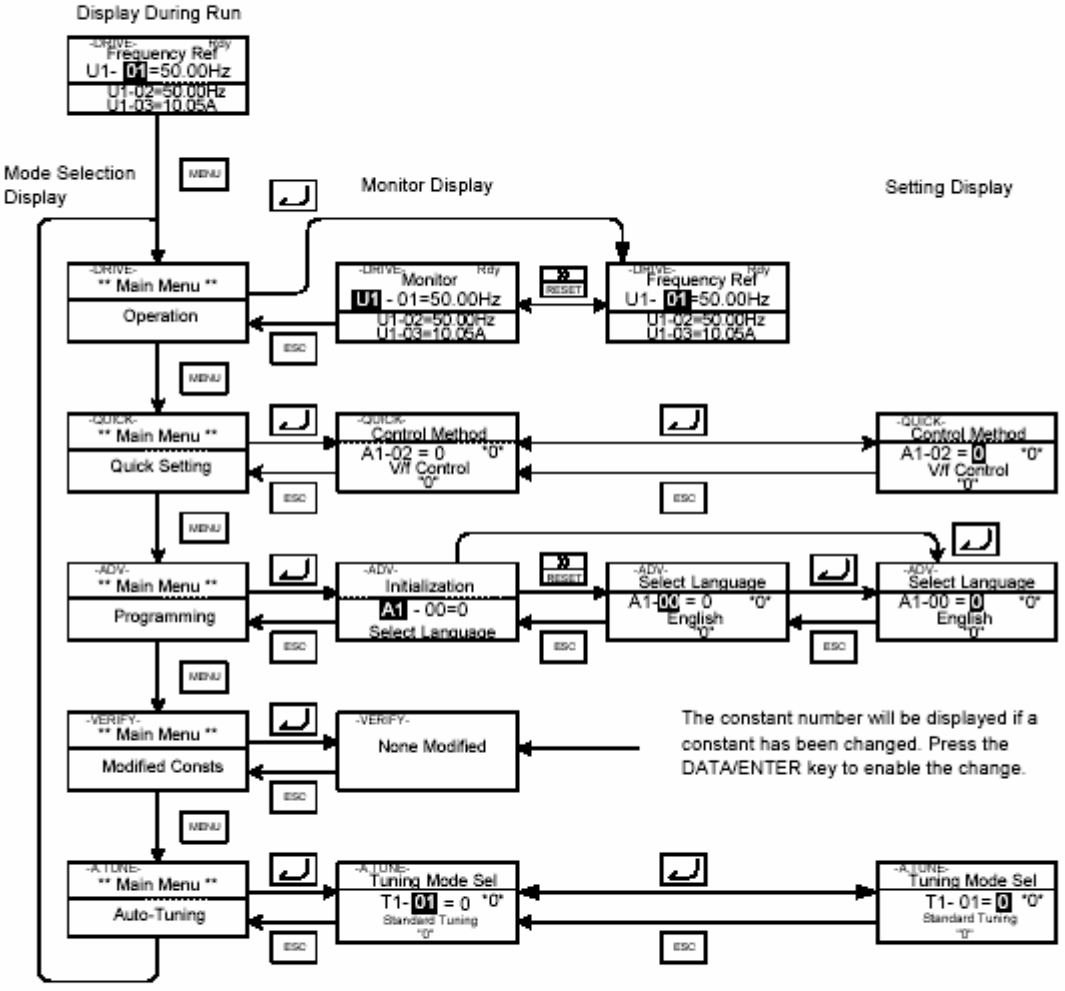
Mode	Primary function(s)
Drive mode	Use this mode to start/stop the inverter, to monitor values such as the frequency references or output current and for displaying fault information or the fault history.
Quick programming mode	Use this mode to read and set the basic parameters.
Advanced programming mode	Use this mode to reference and set all parameters.
Verify mode	Use this mode to read/set parameters that have been changed from their factory-set values.
Autotuning mode*	Use this mode when running a motor with unknown motor data in the vector control modes. The motor data are measured/calculated and set automatically. This mode can also be used to measure only the motor line-to-line resistance.

* Always perform autotuning with the motor before operating in the vector control modes.

Switching Modes

The mode selection display will appear when the MENU key is pressed. Press the MENU key from the mode selection display to switch through the modes in sequence.

Press the DATA/ENTER key to enter a mode and to switch from a monitor display to the setting display.

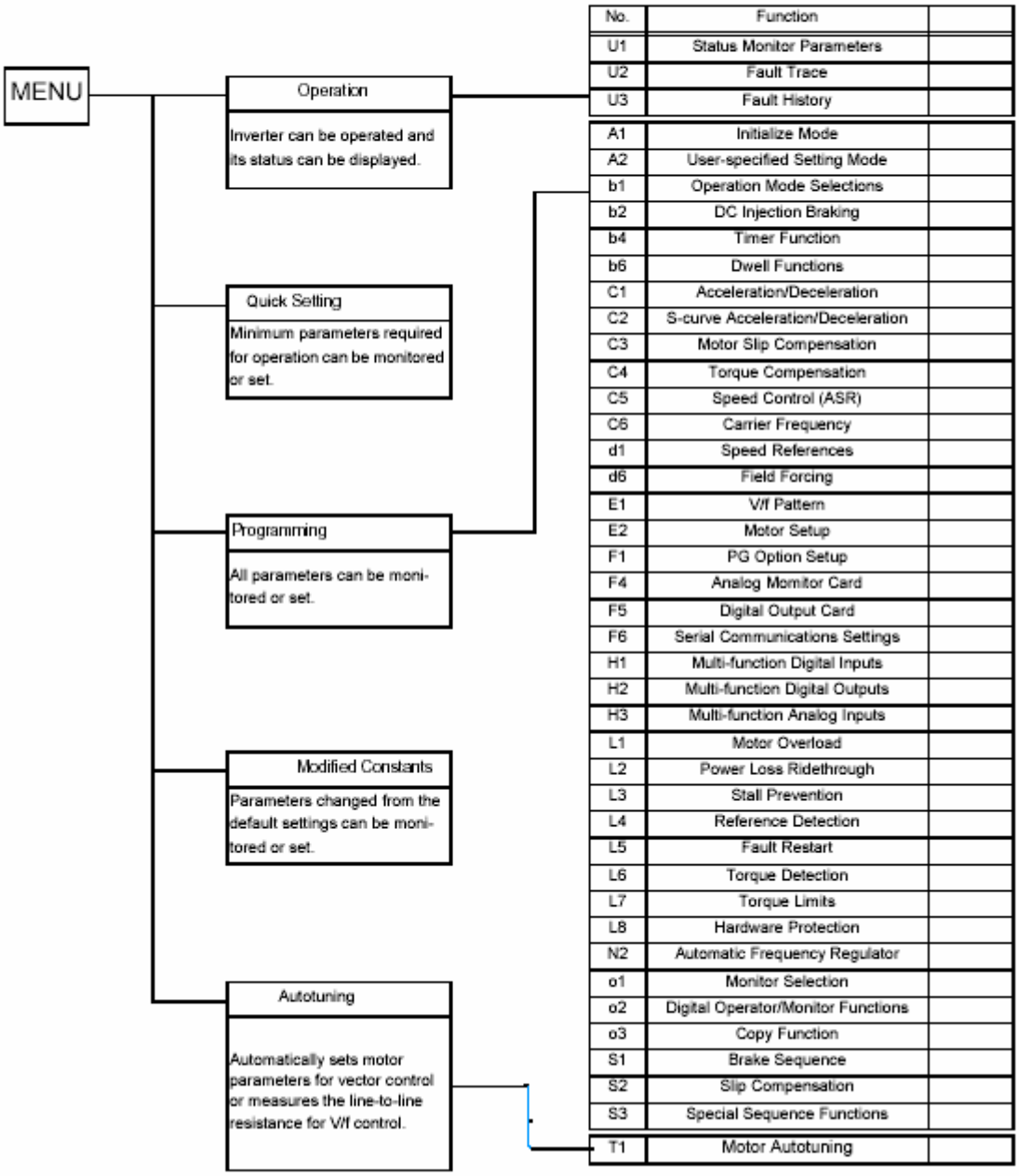


Mode Transitions

To run the inverter after viewing/changing parameters press the MENU key and the DATA/ENTER key in sequence to enter the Drive mode. A Run command is not accepted as long as the drive is in any other mode.
To enable Run commands from the terminals during programming set parameter b1-08 to "1".

Digital Operation Display Functions and Levels

The following figure shows the Digital Operator/Monitor display hierarchy for the Inverter.


MENU
Operation
Inverter can be operated and its status can be displayed.
Quick Setting
Minimum parameters required for operation can be monitored or set.
Programming
All parameters can be monitored or set.
Modified Constants
Parameters changed from the default settings can be monitored or set.
Autotuning
Automatically sets motor parameters for vector control or measures the line-to-line resistance for V/f control.

No.	Function	
U1	Status Monitor Parameters	
U2	Fault Trace	
U3	Fault History	
A1	Initialize Mode	
A2	User-specified Setting Mode	
b1	Operation Mode Selections	
b2	DC Injection Braking	
b4	Timer Function	
b6	Dwell Functions	
C1	Acceleration/Deceleration	
C2	S-curve Acceleration/Deceleration	
C3	Motor Slip Compensation	
C4	Torque Compensation	
C5	Speed Control (ASR)	
C6	Carrier Frequency	
d1	Speed References	
d6	Field Forcing	
E1	V/f Pattern	
E2	Motor Setup	
F1	PG Option Setup	
F4	Analog Monitor Card	
F5	Digital Output Card	
F6	Serial Communications Settings	
H1	Multi-function Digital Inputs	
H2	Multi-function Digital Outputs	
H3	Multi-function Analog Inputs	
L1	Motor Overload	
L2	Power Loss Ridethrough	
L3	Stall Prevention	
L4	Reference Detection	
L5	Fault Restart	
L6	Torque Detection	
L7	Torque Limits	
L8	Hardware Protection	
N2	Automatic Frequency Regulator	
o1	Monitor Selection	
o2	Digital Operator/Monitor Functions	
o3	Copy Function	
S1	Brake Sequence	
S2	Slip Compensation	
S3	Special Sequence Functions	
T1	Motor Autotuning	

Setting Parameters

Here the procedure to change C1-01 (Acceleration Time 1) from 1.5 s to 2.5 s is shown.

Setting Parameters in Advanced Programming Mode

Step No.	Digital Operator Display	Description
1	-DRIVE- Rdy Frequency Ref U1- 01=50.00Hz U1-02=50.00Hz U1-03=10.05A	Power supply turned ON.
2	-DRIVE- ** Main Menu ** Operation	Press the MENU key 3 times to enter the advanced programming mode.
3	-QUICK- ** Main Menu ** Quick Setting	
4	-ADV- ** Main Menu ** Programming	
5	-ADV- Initialization A1-00=1 Select Language	Press the DATA/ENTER to access the monitor display.
6	-ADV- Accel / Decel C1-00 = 1.50sec Accel Time 1	Press the Increment or Decrement key to display the parameter C1-01 (Acceleration Time 1).
7	-ADV- Accel Time 1 C1-01 = 001.50sec (0.00 ~ 600.0) "1.50sec"	Press the DATA/ENTER key to access the setting display. The current setting value of C1-01 is displayed.
8	-ADV- Accel Time 1 C1-01 = 001.50sec (0.00 ~ 600.0) "1.50sec"	Press the Shift/RESET key to move the flashing digit to the right.
9	-ADV- Accel Time 1 C1-01 = 011.50sec (0.00 ~ 600.0) "1.50sec"	Press the Increment key to change set value to 2.50 s.
10	-ADV- Accel Time 1 C1-01 = 012.50sec (0.00 ~ 600.0) "1.50sec"	Press the DATA/ENTER key to save the set data.
11	-ADV- Entry Accepted	"Entry Accepted" is displayed for 1 sec after pressing the DATA/ENTER key.
12	-ADV- Accel Time 1 C1-01 = 2.50sec (0.00 ~ 600.0) "1.50sec"	The display returns to the monitor display for C1-01.

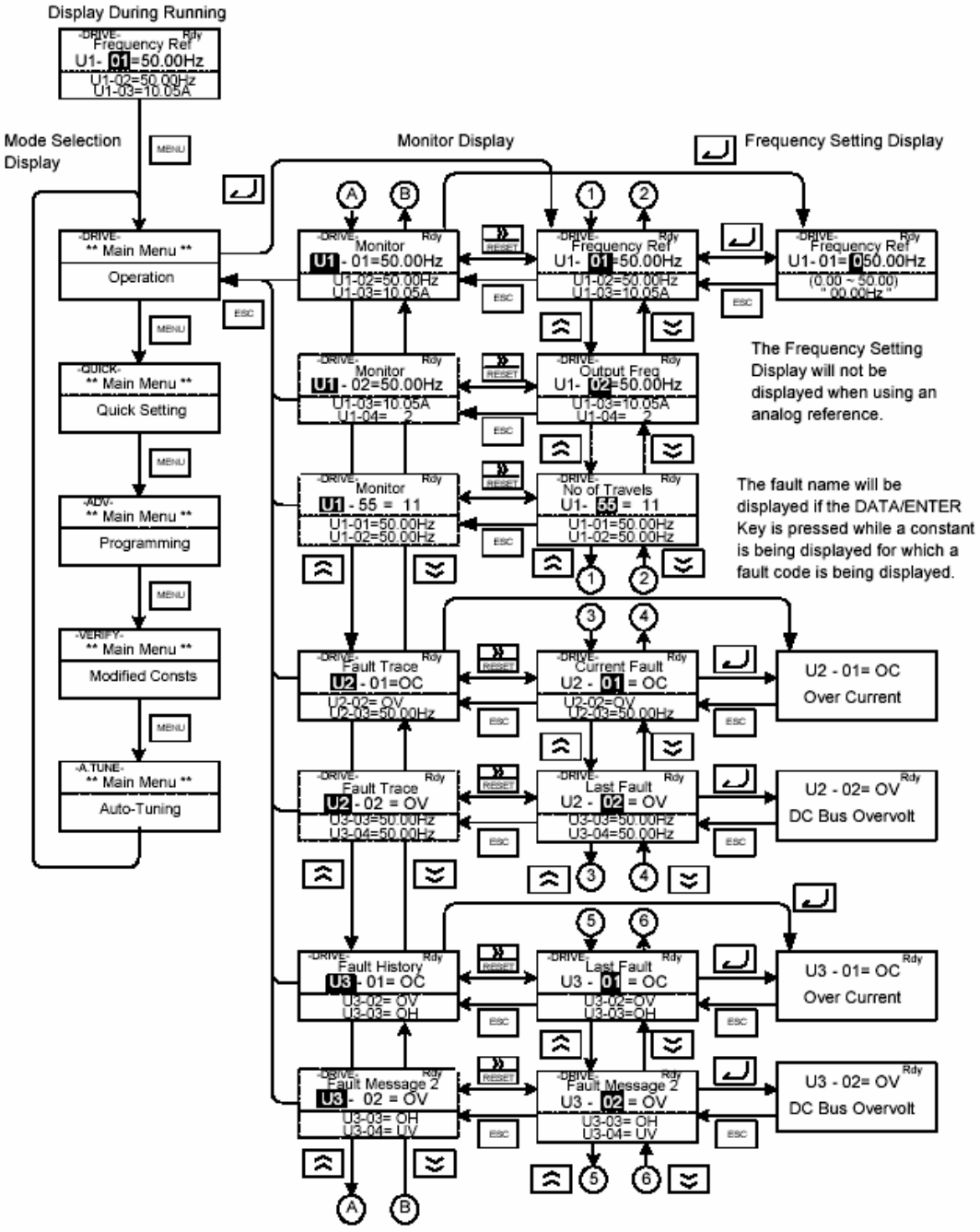
◆ Drive Mode (Operation)

The Drive mode is the mode in which the Inverter can be operated. All monitor parameters (U1-☐☐) as well as fault information and the fault history can be displayed in this mode

When b1-01 (Reference selection) is set to 0, the selected frequency reference value (d1-☐☐) can be changed in the frequency setting display using the Increment, Decrement, Shift/RESET and Enter keys. The parameter will be written and the display returns to the Monitor display.

■Example Operations

Example key operations in drive mode are shown in the following figure.



Operations in Drive Mode

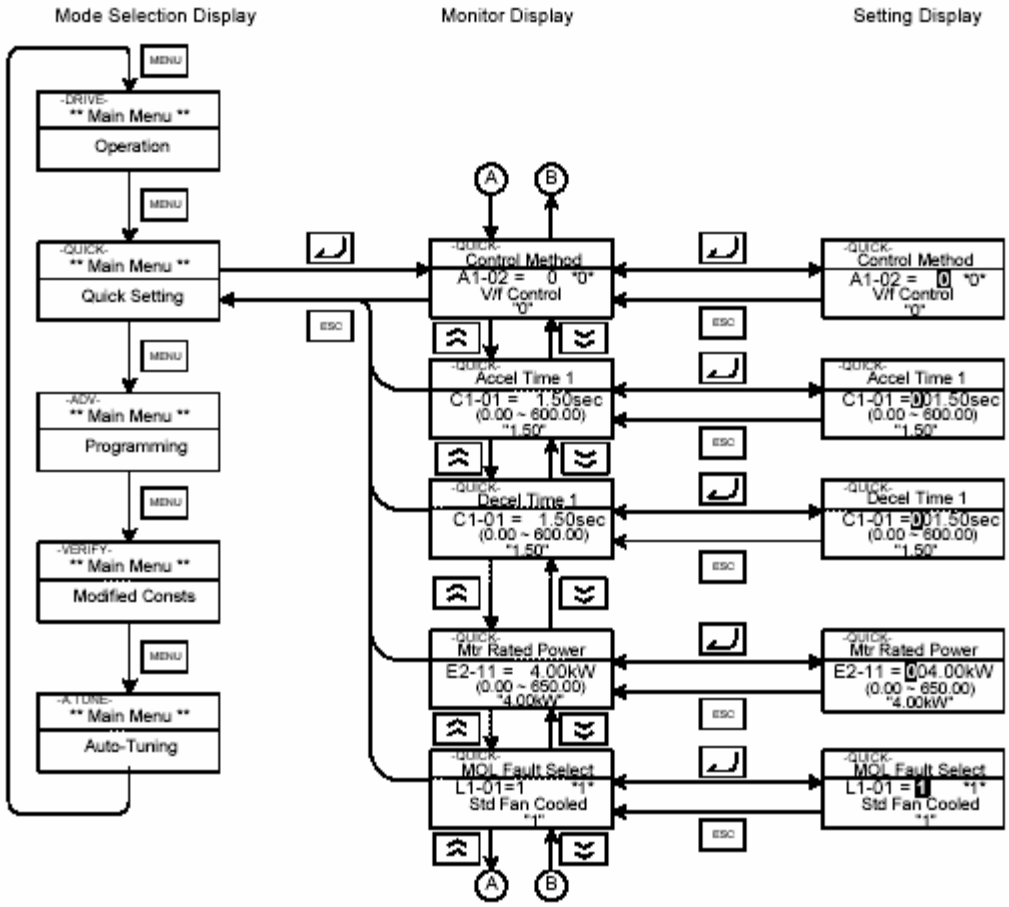
Quick Programming Mode (Quick Setting)

In quick programming mode, the basic parameters required for the elevator operation like speeds, acceleration/deceleration times etc. can be monitored and set.

The parameters can be changed from the setting displays. Use the Increment, Decrement, and Shift/RESET keys to change the frequency. The parameter will be written and the monitor display will be returned to when the DATA/ENTER key is pressed after changing the setting.

■Example Operations

Example key operations in quick programming mode are shown in the following figure.



Operations in Quick Programming Mode

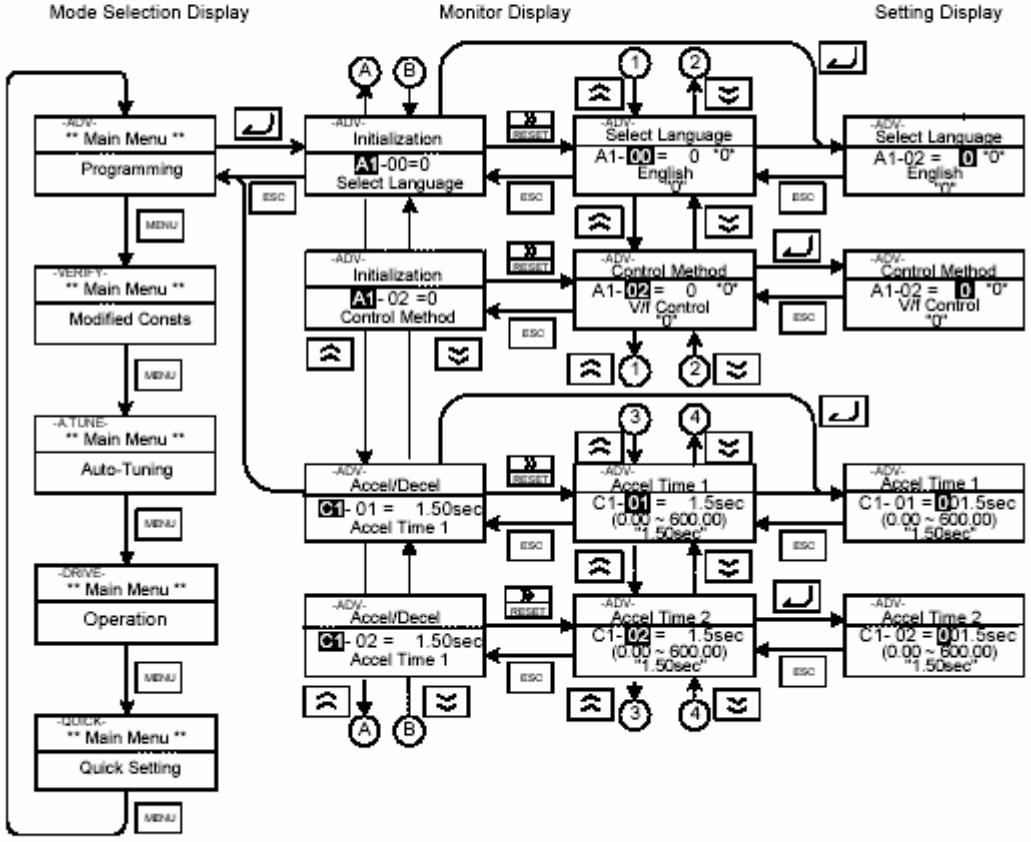
Advanced Programming Mode (Programming)

In advanced programming mode all Inverter parameters can be monitored and set.

A parameter can be changed from the setting displays using the Increment, Decrement, and Shift/RE keys. The parameter will be saved and the display will return to monitor display when the DATA/ENTER is pressed after changing the setting.

■Example Operations

Example key operations in advanced programming mode are shown in the following figure.



Operations in Advanced Programming Mode

Verify Mode (Modified Constants)

The Verify mode is used to display any parameters that have been changed from their default settings in a programming mode or by autotuning. “None” will be displayed if no settings have been changed.

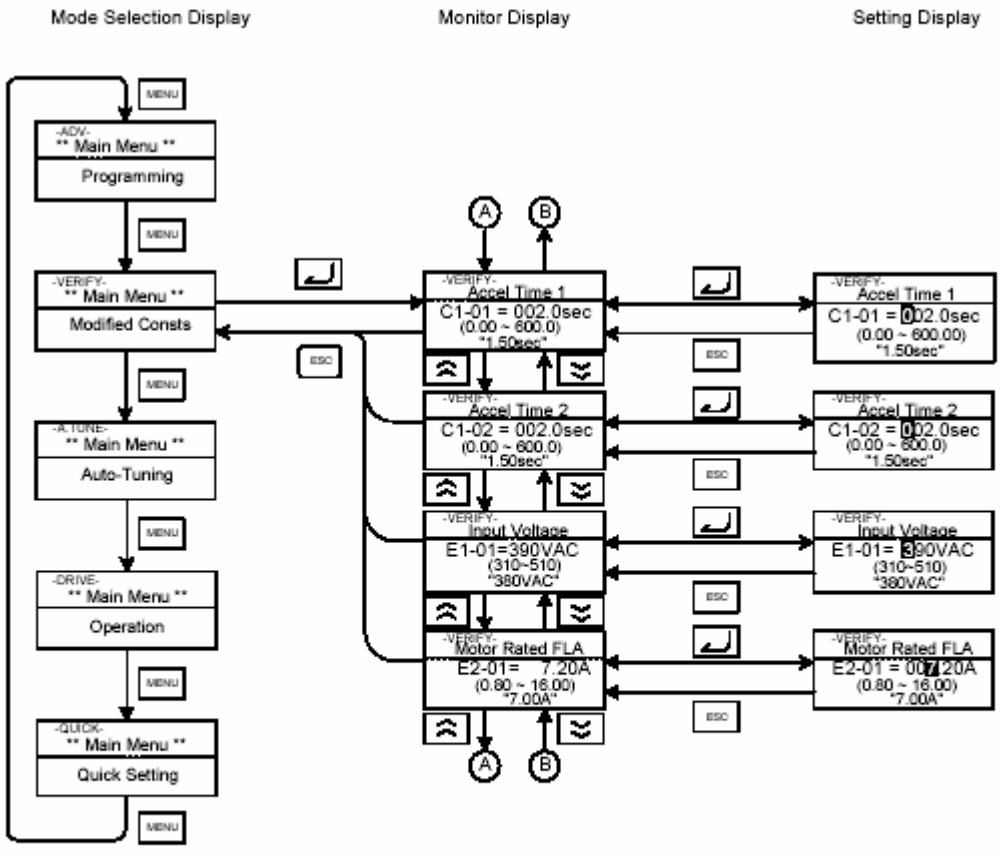
The parameter A1-02 is the only parameter from the A1-□□ group, which will be displayed in the modified constant list if it has been changed before. The other parameters will not be displayed, even if they are different from the default setting.

In the verify mode, the same procedures can be used to change settings as they are used in the programming mode. Use the Increment, Decrement, and Shift/RESET keys to change a setting. When the DATA/ENTER key is pressed the parameter setting are written and the display returns to the Monitor display.

■Example Operations

In the example below the following settings have been changed from their default settings:

- C1-01 (Acceleration Time 1)
- C1-02 (Acceleration Time 2)
- E1-01 (Input Voltage Setting)
- E2-01 (Motor Rated Current).



Operations in Verify Mode

Autotuning Mode (Autotuning)

Autotuning automatically measures and sets the required motor data in order to achieve the maximum performance. Always perform autotuning before starting operation when using the vector control modes.

When V/f control has been selected, stationary autotuning for line-to-line resistance can be selected only.

When the motor cannot be operated (e.g. if the ropes cannot be removed from the traction sheave), and Open Loop or Closed Loop Vector Control shall be used, perform stationary autotuning.

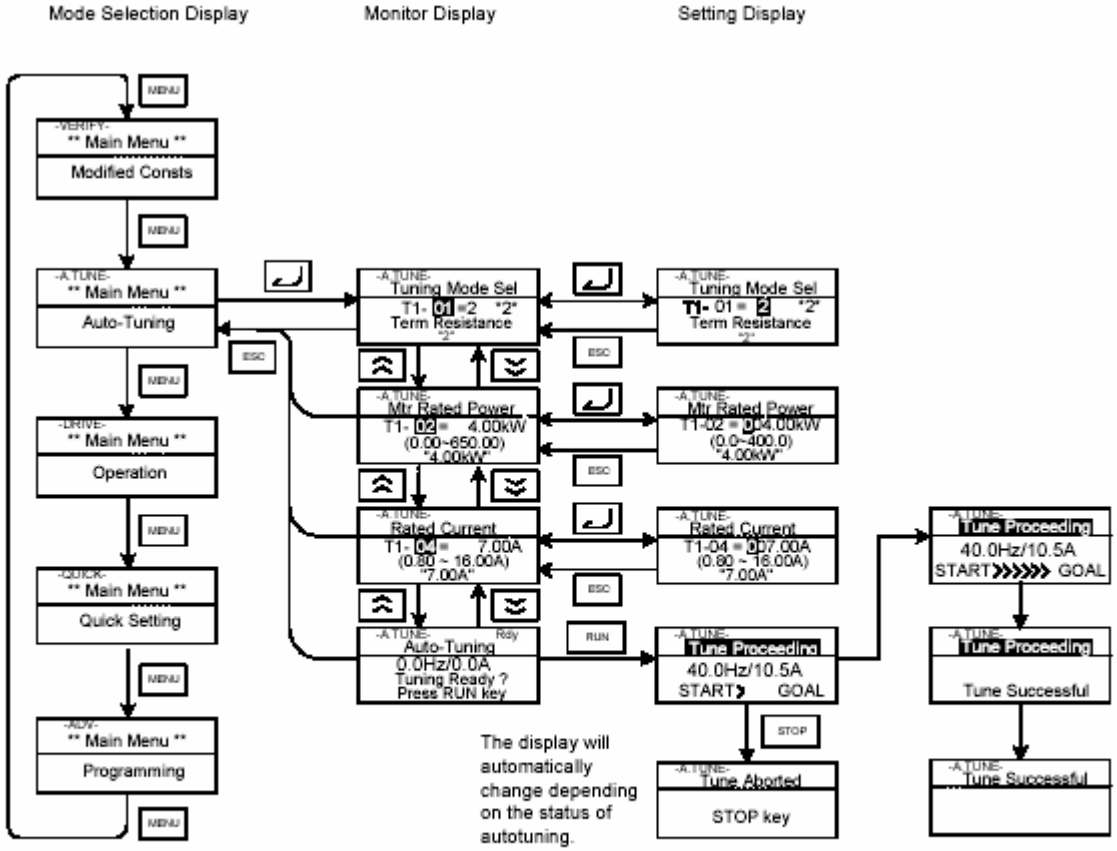
■Example of Operation for V/f control

The tuning method for V/f control is fixed to the measurement of the terminal resistance (T1-01=1). Input the the rated output power and the rated current specified on the nameplate of the motor and then press the RUN key. The motor data are measured automatically.

Always set the above items. Otherwise autotuning cannot be started, e.g. it cannot be started from the motor rated voltage input display.

A parameter can be changed from the setting displays using the Increment, Decrement, and Shift/RESET keys. The parameter will be saved when the DATA/ENTER key is pressed.

The following flowchart shows a V/f control Autotuning example.



Operation in Autotuning Mode

SECTION E

Parameters

PROGRAMMING MENU

Group A

A1-02 Control method, Sets control method.
2 is open loop vector
3 is closed loop vector

Group C

C1-01 Accel time 1 Set to 1.5 seconds
C1-02 Decel time 1 Set to 1.5 seconds

C2-01 Scrv Acc @ Start Set to 0.5 seconds
C2-02 Scrv Acc @ End Set to 0.5 seconds
C2-03 Scrv Dec @ Start Set to 0.5 seconds
C2-04 Scrv Dec @ End Set to 0.5 seconds
C2-05 Scrv @ Lev Set to 0.5 seconds

C3-01 Slip Comp Gain Set to 1
C3-02 Slip Comp Time Set to 2000ms (OLV only)
C3-03 Slip Comp Limit Set to 200% (OLV only)

C6-02 Carrier Freq Set to Hex 0003

Group D

D1-09 vn Reference Set to 47HZ (High Speed)
D1-10 v1 Reference Set to 30HZ (Medium Speed)
D1-14 vi Reference Set to 15HZ (Inspection Speed)
D1-17 vl Reference Set to 4HZ (Levelling Speed)

Group F

F1-01 PG Pulses per rev Set to 1024 (CLV only)

Group L

L6-02 Torq det level Set to 150%

Group S

S1-04 Sets DC Injection at start Set to 0.7 seconds
S1-05 Sets DC Injection at stop Set to 0.8 seconds
S1-06 Sets Brake open delay Set to 0.2 seconds

S1-07 Sets Brake close delay	Set to 0.3 seconds
S1-22 Torque comp time@start	Set to 500ms (CLV only)
S1-23 Torque comp gain lowering	Set to 1.0 (CLV only)
S1-24 Torque comp bias raising	Set to 0% (CLV only)
S1-25 Torque comp bias lowering	Set to 0% (CLV only)

Group T

T1-01 Sets the Autotuning Mode	Set to 1 (non rotating autotune)
T1-02 Sets Motor rated power	Set as required, see motor data plate.
T1-03 Sets Motor rated voltage	Set as required, see motor data plate.
T1-04 Sets Motor rated current	Set as required, see motor data plate.
T1-05 Sets Motor rated frequency	Set as required, see motor data plate.
T1-06 Sets Motor number of poles	Set as required, see plate, 1000rpm=6 pole 1500rpm=4 pole
T1-07 Sets Motor rated speed	Set as required, see motor data plate.
T1-08 Sets PG pulses/rev	Set as required, see motor data plate.
T1-09 Sets Motor no load current	Set as 50% of T1-04 (Motor rated current)

SECTION F

Auto- tuning

Press the Menu button until the Auto –Tuning Mode prompt is displayed, press “DATA/ENTER” key, enter all the required information in Auto-tuning parameters T1-01 to T1-09, when completed press the “Increment” key once, Auto-tuning is now ready, press the “RUN” key and fit a temporary short across terminals TUD and TDN, the main contactor will actuate and Auto-tuning will now commence, after a short period the Digital Operator should display “GOAL”
Auto-tuning is now complete.

(On earlier versions of the L7 invertor it may be necessary to temporarily short terminals M3 & M4 to allow energisation of the main contactors)

SECTION G

Commissioning procedure

N.B Commissioning procedure is to be carried out by competent personnel only.

WARNING : DO NOT TURN POWER ON & OFF MORE THAN 5 TIMES EVERY 15 MINUTES OR INTERNAL COMPONENTS MAY BE DAMAGED !!!

Equipment Required.

1. A Tachometer.

2. An A.C current meter. (Moving coil, not digital)

Pre Switch On Checks.

1. Check all site wiring and mains cable rating are correct.

2. Check the installation is in conformance with the EMC standards.

3. Ensure the lift is counter balanced correctly.

4. Ensure the encoder is fitted correctly aligned and connected to the controller correctly if required

5. Ensure the lift doors cannot open (can be done by for the Interflite by switching on DIL switch SP1 and PRPTT or on Skycom by disabling the doors by the parameter in the door setup menu).

.Speed settings.

NOTE: ALL SPEED SETTINGS ARE IN Hz NOT RPM.

1. Simulate the Test Up button, check the lift runs in the UP Direction on test speed and the UP contactor is energised. If the lift runs DN reverse two of the motor phases and A&B pulses if required, then retest.

2. Simulate a Test Dn button and check the lift moves DN at test speed and the speed is the desired value, if not adjust speed D1-14.

3. Ensure all the limit switches are operating correctly and place the lift empty car at the bottom floor, Switch the lift to NORMAL and run the lift UP in high speed, and ensure the lift slows into floor correctly, repeat for the down direction.

4. Place the lift empty car at the top floor and run the lift DN, ensure the high speed is the same in both directions, also ensure the levelling speed is the same in both directions, if not follow slip compensation procedures detailed in pages 24-26.
Note: At open loop control feed forward type slip compensation (S1-XX) is acting additional to standard slip compensation. Therefore motoring site levelling speed might be higher than set value. Please monitor and adjust S1-02 and C3-01 to have the same speed in both directions.

5. Check the contract speed is correct for the site and adjust the parameters D1-09 for high speed and D1-17 for levelling speed to the required values.

6. If the lift overshoots floor level or has a long levelling time into floor then adjust the slowing distance combined with deceleration rate C1-02 and the s-curves C2-03, 4 to acquire a reasonable comfort levelling with a minimum levelling time.

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7. Place the lift empty car at the top floor and run the lift DN in high speed, ensure when the lift slows the lift levelling speed is equal in the UP and DN direction.

Setting the acceleration and starting.

1. Run the lift and note the acceleration rate.

2. Adjust the Acceleration rate C1-01 and s-curve C2-01, 2 parameters for the desired acceleration that is required.

Stall test

1. Disconnect the brake and isolate. Switch the lift to test and switch on the controller.

2. Place the clamp meter on a phase of the incoming mains.

3. Simulate the test up push and the meter should be showing more than 1.5*flc. If the meter is showing 1.5 * flc or more, the regulator trips in the time specified in parameter L6-03. To reset switch the controller off then on.

4. Repeat in the DN direction.

5. Reconnect the brake.

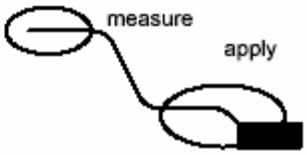
N.B. To reset the regulator after a fault press the RESET or switch the panel off for at least 30 sec then on again. After commissioning run the lift for at least 1 hour and ensure floor levels are consistent and the lift performs correctly.

Slip compensation for V/f and Open loop vector

To obtain better leveling accuracy, smooth brake closing and leveling current reduction.
To use this function, d1-18 must be set to 1 or 2.

Principle:
200ms after speed-agree (selected speed, vn, v1, v2 or v3), inverter measures for 200ms the current or torque reference and calculates average value for this time period. This amount of **EST(= End Speed Torque,current)** will be used for the calculation of slip . This amount of slip can be applied the speed reference when inverter is running at the leveling speed.
Speed-agree time (appox.200ms) and measurement time must be factory level parameters

Note: For ***"Inspection Speed, vi"*** the described functions are not applicable, because a motor coasts to stop (base block) by the stop command.

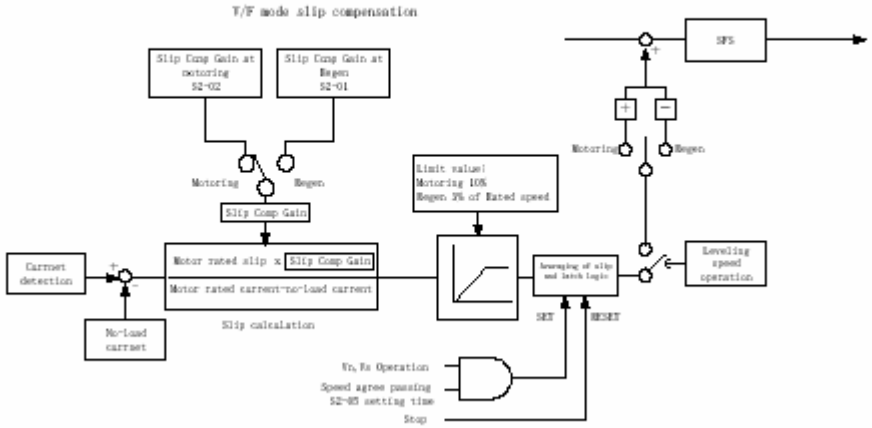


Setting parameters:

Parameter No	Name	Unit	V/f W/o PG	OLV	CLV
S2-01	Motor rated speed	RPM	○	×	×
S2-02	Slip comp gain at motoring		○	○	×
S2-03	Slip comp gain at ragen		○	○	×
S2-04	Slip comp limit	%	○	○	×
S2-05	Torque detection delay time	ms	○	○	×
S2-06	Torque detection filtering time	ms	○	○	×
S2-07	Slip comp delay time	sec	×	○	×
U1-50	Slip comp value monitor	Hz	○	○	×

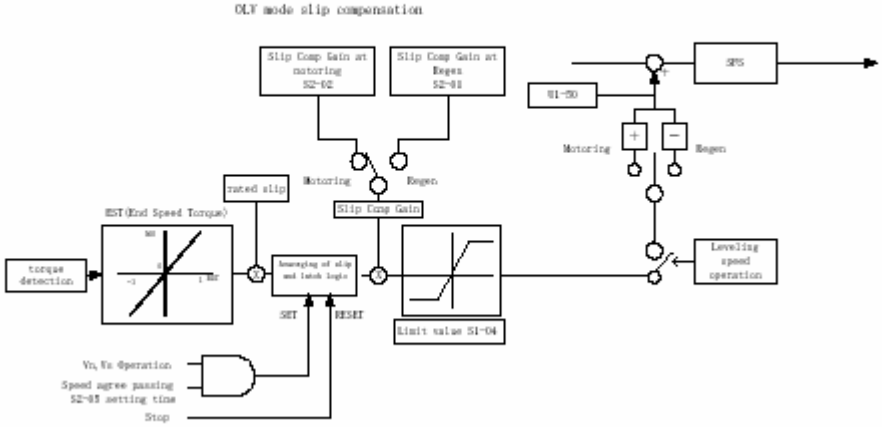
V/f mode slip compensation

The following block diagram is shown the slip compensation at V/f mode.



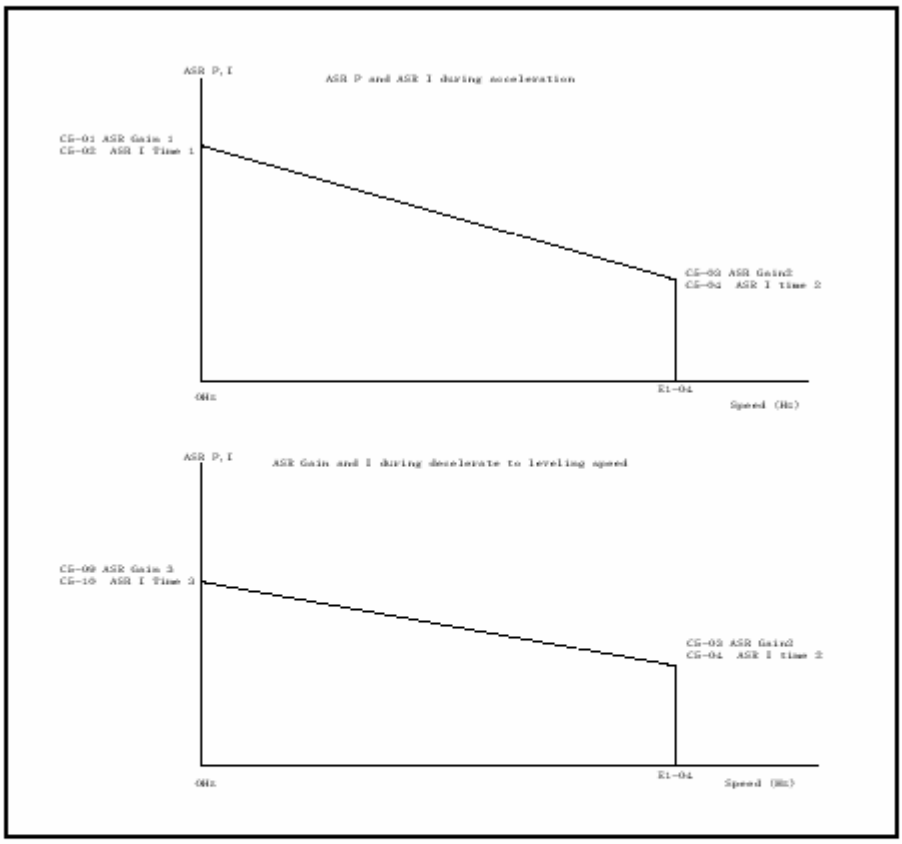
OLV mode slip compensation

The following block diagram is shown the slip compensation at OLV mode.



Automatic Speed Regulator (Closed Vector control only)

L7 has two sets of ASR parameters. One is for acceleration , the other is for decelerate to the leveling speed.



Inertia Compensation

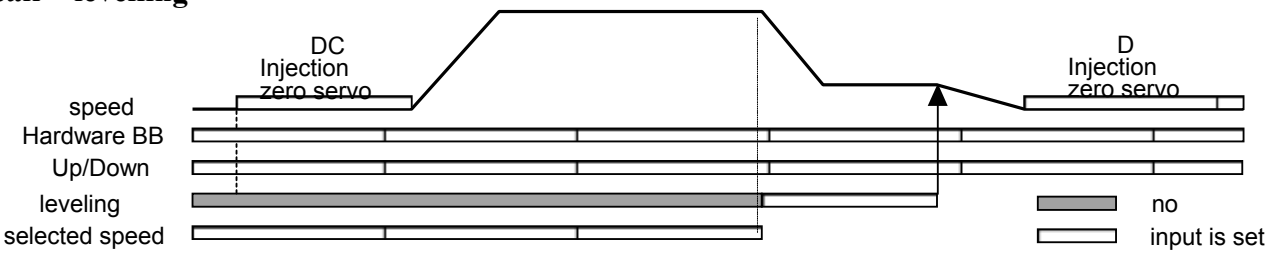
To eliminate the overshoot or undershoot of speed, L7 has the feed forward control . There are two parameters. One is for estimated acceleration time to the rated speed with motor rated torque. The other is the feed forward proportional gain for fine tuning,

Parameter No	Name	Setting
N5-01	Feed forward control selection	0:disabled 1:enabled
N5-02	Motor acceleration time	Sec
N5-03	Feed forward proportional gain	

• SPEED SELECTION

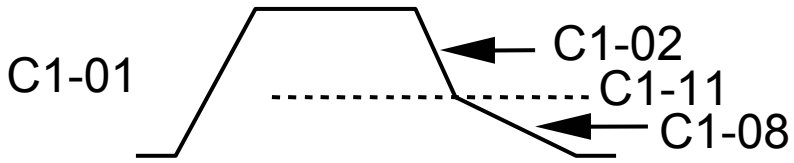
- **PRIORITIES DEFINED AS FOLLOWS D1-18=1 is preferred type for safety :**

- **D1-18 = 1**
  (high speed has priority)
  levelling STOPS. If levelling command is not configured, Up/Down STOPS.
  wires break = levelling

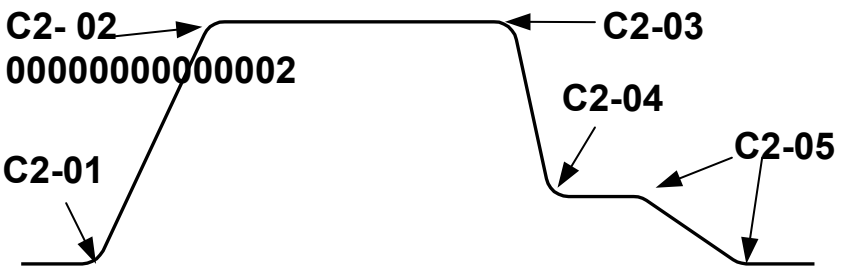


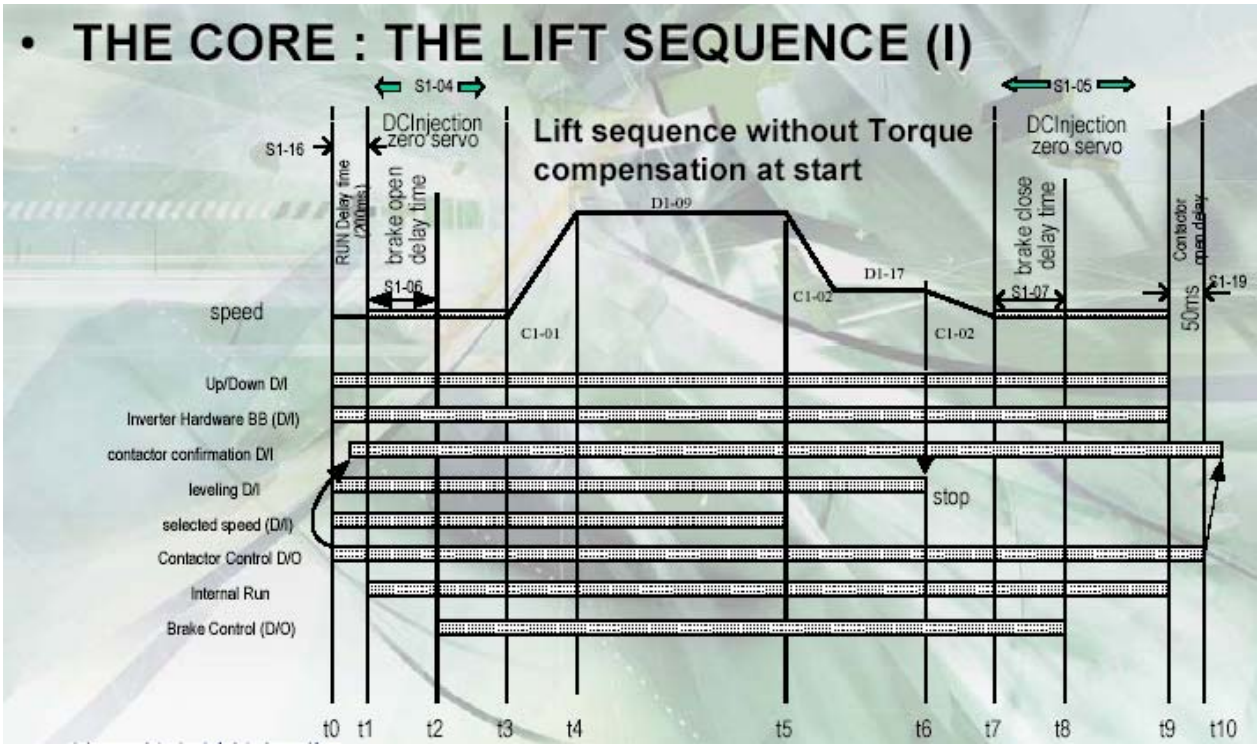
• DECELERATION AND S-CURVE SETTINGS

- **C1-11 changes decel time from C1-02 to C1-08 only in decel section.**



- **Additional S-Curve setting C2-05 for STOP. Very useful to modify stopping point without affecting deceleration ride quality.**





t1 DC inj time starts
t1-t2 DC inj time during brake applied S1-06 = 0.2 seconds
t2-t3 DC inj time during brake lifted S1-04 to S1-06 = 0.5 seconds
t1-t3 DC inj time at start S1-04 = 0.7 seconds

t7 DC inj time starts
t7-t8 DC inj time before brake applied S1-07 = 0.3 seconds
t8-t9 DC inj time during brake applied S1-05 to S1-07 = 0.5 seconds
t7-t9 DC inj time at stop S1-05 = 0.8 seconds

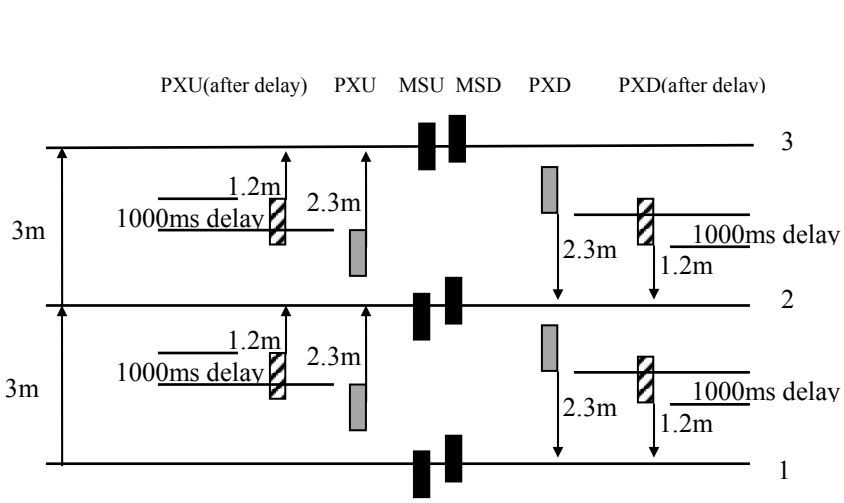
SECTION H

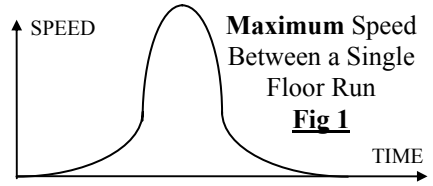
Single Floor Run Operation with SKYCOM Control System

Single Floor Run operation, or where the lift is unable to reach high speed on a single journey can be set-up using medium speeds with a PX delay system. Parameter settings for different speeds between floors and slowing delays (PX delays) for each speed at each floor allow the user to set the lift to run between certain floors at the required reduced speed and the PX can be delayed to give the required slowing distance for that reduced speed to minimize flite time and hence levelling time.

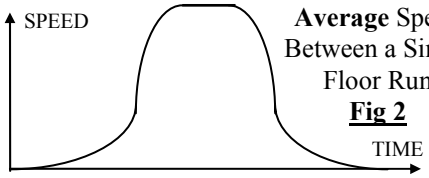
Consider the following example:

i) Contract Speed 1.6m/s
ii) Floor Height 3m
iii) Omron Top Speed Setting(D1-09 Reference=47hz)
iv) Omron Medium Speed 1 Default Setting (D1-10 Reference=37hz)
v) Slowing Distance(on top speed) 2.3m approx.





Maximum Speed Between a Single Floor Run **Fig 1**



Average Speed Between a Single Floor Run **Fig 2**

Vertual PX created By delay in Skycom

Set-up Procedure

1) The stepping/slowing magnets are set to the maximum slowing distance 2.3 meters (i.e. slowing distance for top speed). Also all **PX delays** should be set to **0s**.
2) Set the medium speed 1 frequency in the Inverter (**Reference 5**) initially to the same as top speed i.e. **50Hz**.
3) Run the lift between the single floor and adjust the PX delay (in milliseconds) for that floor to allow the lift to reach the highest speed possible and to give the desired levelling time. i.e. too big a delay will cause the lift to overshoot floor level and too little will give excess levelling time. For this example let us assume it to be **500ms**.
4) Run the lift between the single floor and make a note of the maximum frequency reached as displayed in the readout on the Omron keypad Interface this value is now entered in to speed

reference 5. For this example let us assume it to be **42Hz.** The speed time graph should be as **Fig 1** above.

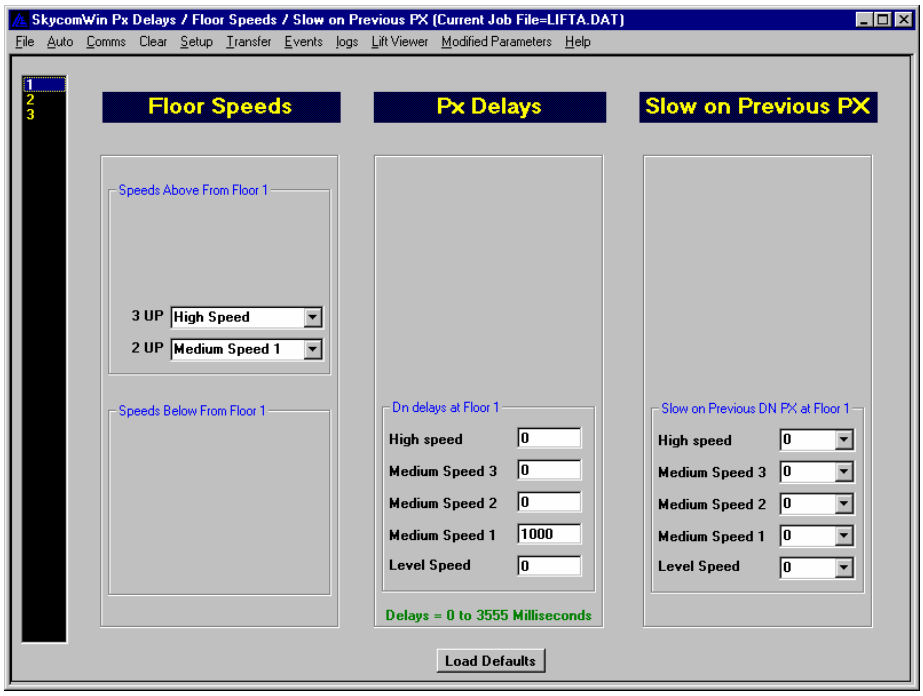
5) If the ride quality is bumpy at the time the speed changes, then it is now necessary to reduce the speed and increase the PX delay until a satisfactory ride quality is achieved. For example the best ride quality may be found with a speed of **38Hz** and a PX delay of **1000ms.** This would relate to **Fig 2.**

6) The single floor run is now setup and assuming equal floor heights, the PX delay and speed reference 5 can be used for all relevant floors, otherwise the same procedure is adapted for the other floor to floor heights.

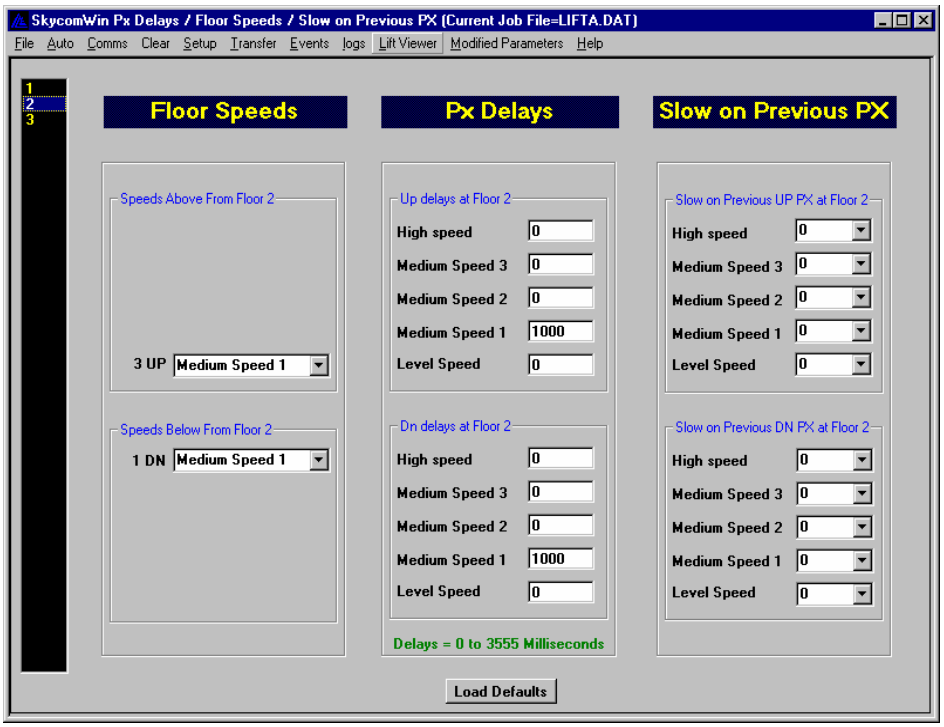
From the previous example the parameter settings are illustrated below via the use of the SKYCOMWIN P.C./Lap top software, i.e. top speed for a single floor run = **38Hz** with a PX delay of **1000ms**.

From below it can be seen that at floor 1 the speed up to floor 2 is set for Medium Speed 1.

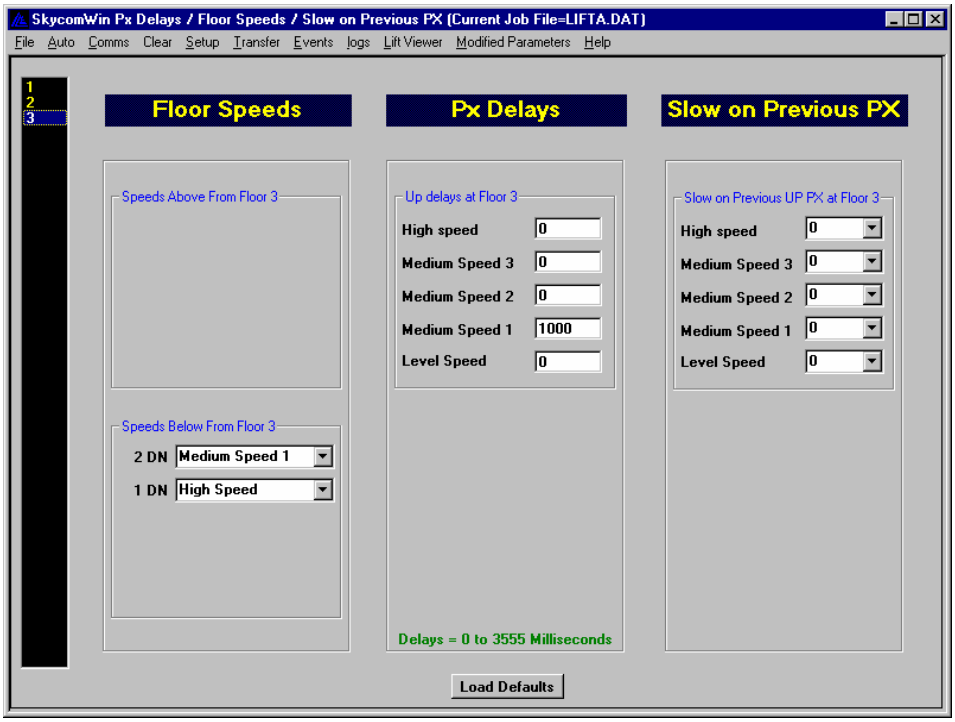
Also when the lift is approaching floor 1 in the down direction on Medium Speed 1 (i.e. from level 2) the PX delay is set to 1000ms.


SkycomWin Px Delays / Floor Speeds / Slow on Previous PX (Current Job File=LIFTA.DAT)
File Auto Comms Clear Setup Transfer Events logs Lift Viewer Modified Parameters Help
1
2
3
Floor Speeds
Px Delays
Slow on Previous PX
Speeds Above From Floor 1
3 UP High Speed
2 UP Medium Speed 1
Speeds Below From Floor 1
Dn delays at Floor 1
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 1000
Level Speed 0
Slow on Previous DN PX at Floor 1
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 0
Level Speed 0
Delays = 0 to 3555 Milliseconds
Load Defaults

.
From below it can be seen that at floor 2 the speed up to floor 3 and down to floor 1 is set for Medium Speed 1. Also when the lift is approaching floor 2 in the down direction on Medium Speed 1(i.e. from level 3) the PX delay is set to 1000ms and hence the same applies coming up to floor 2 from floor 1.


SkycomWin Px Delays / Floor Speeds / Slow on Previous PX (Current Job File=LIFTA.DAT)
File Auto Comms Clear Setup Transfer Events logs Lift Viewer Modified Parameters Help
1
2
3
Floor Speeds
Px Delays
Slow on Previous PX
Speeds Above From Floor 2
3 UP Medium Speed 1
Speeds Below From Floor 2
1 DN Medium Speed 1
Up delays at Floor 2
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 1000
Level Speed 0
Dn delays at Floor 2
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 1000
Level Speed 0
Delays = 0 to 3555 Milliseconds
Slow on Previous UP PX at Floor 2
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 0
Level Speed 0
Slow on Previous DN PX at Floor 2
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 0
Level Speed 0
Load Defaults

From below it can be seen that at floor 3 the speed down to floor 2 is set for Medium Speed 1. Also when the lift is approaching floor 3 in the up direction on Medium Speed 1(i.e. from level 2) the PX delay is set to 1000ms.


SkycomWin Px Delays / Floor Speeds / Slow on Previous PX (Current Job File=LIFTA.DAT)
File Auto Comms Clear Setup Transfer Events logs Lift Viewer Modified Parameters Help
1
2
3
Floor Speeds
Px Delays
Slow on Previous PX
Speeds Above From Floor 3
Speeds Below From Floor 3
2 DN Medium Speed 1
1 DN High Speed
Up delays at Floor 3
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 1000
Level Speed 0
Delays = 0 to 3555 Milliseconds
Slow on Previous UP PX at Floor 3
High speed 0
Medium Speed 3 0
Medium Speed 2 0
Medium Speed 1 0
Level Speed 0
Load Defaults

These parameters can also be set from the SKYCOM keypad interface. A password level 2 is required before changing, but can be obtained from ILE on request. Menu options FLOOR SPEED SETUP allow the floor speeds to be changed, and PX DELAYS SETUP allow the PX delays to be set for each floor and approach speed.

SECTION I

Fault Finding

The following section shows the common fault codes with a description of the fault and cause.

Fault categories

The L7 has the following fault categories

Alarm Inverter continues Running and alarm D/O will be set

Fault 1 Inverter will stop; the fault output relay is activated immediately. The reset command Can be accepted when the fault condition has gone.

Fault 2 A fault categorized as fault 2 cannot be reset until the power is switched off and then Restored.

Alarm code

Alarm	EF	External Fault	Forward and reverse commands input together
	UV	Under voltage	Main circuit under voltage condition (not inverter running)
	OV	Over voltage	Main circuit DC voltage exceeds the overvoltage detection level
	OH	Over heating	Cooling fin temperature exceeds L8-02 pre-alarm level
	OL3	Overtorque detection 1	The inverter output current exceeds L6-02 level for L6-03 time
	OL4	Overtorque detection 2	The inverter output current exceeds L6-05 level for L6-06 time
	UL3	Undertorque detection 1	The inverter output current reached below L6-02 for L6-03 time
	UL4	Undertorque detection 2	The inverter output current reached below L6-05 for L6-06 time
	OS	Overspeed	The motor speed from PG exceeds the F1-08 level for F1-09 time.
	PGO	PG disconneted	PG disconnected PG pulses aren't being input even if inverter running
	DEV	Excessive speed deviation	The speed deviation is greater than F1-10 for F1-11 time.
	EF1~7	External fault input	The multi-funciton digital input is programmed as the external fault. The terminal assigned EF is input.
	CE	Communication Error	Memobus communication is stopped for 2sec.

Fault 1 code (resetable fault)

Fault1	OC	Overcurrent	The inverter output current exceeded the overcurrnet detection level. (Appox. 200% of rated currnet)
	GF	Ground Fault	The ground fault current at the inverter outputexceeded approximately 50% of the inverter rated current.
	PUF	Fuse Blown	The fuse in the main circuit is blown. The main IGBT transistor has failed.
	OV	Main circuit Overvoltage	The main circuit DC voltage exceeded the overvoltage detection level.
	UV1	Main circuit Under voltage	The main circuit DC voltage is below the undervoltage detection level.
	UV2	Contorl Power Fault	The control power supply voltage dropped.
	UV3	Inrush prevention circuit fault	A fault occurred in the surge prevention circuit.
	PF	Main circuit Voltage fault	The main circuit DC voltage oscillates unusually.
	LF	Output Open Phase	An open-phase occurred at the inverter output .
	OH	Cooling fin Overheating	The temperature of the inverter's cooling fins exceeds the setting of L8-02.
	OH3	Motor Overheating Alarm	The inverter will stop or continue to operate according to the setting of L1-03.
	OH4	Motor overheating fault	The inverter will stop according to the setting of L1-04.
	RH	Installing Braking resistor overheating	Inverter calculates the time of Braking resistor overheating.
	RR	Installing Braking Resistor fault	The braking transistor is not operating properly.
	OL1	Motor Overload	The motor overload protection function has operated based on the internal electronic thermal value.
	OL2	Inverter Overload	The inverter overload protection function has operated based on the internal electronic thermal value.
	OL3	Overtorque Detection1	There has been a current greater than the setting in L6-02 for L6-03 time.
	OL4	Overtorque Detection 2	There has been a current greater than the setting in L6-05 for L6-06 time.
	UL3	Undertorqaue Detection 1	There has been a current less than L6-02 for L6-03 time.
	UL4	Undertorque Detection 2	There has been a currnet less than L6-05 for L6-06 time.
	OS	Overspeed	The motor speed has been greater than the setting of F1-08 level for F1-09 setting time.
	PGO	PG disconnection Detected	There is no PG pulse input during motor running.
	DEV	Excessive Speed Deviation	The speed deviation has been greater than F1-10 setting level for F1-11 setting time.
	CF	Contorl Fault	The torque limit was reached continuously for 3 seconds or Longer during deceleration stop at open-loop vector mode.
	EF0	External fault from Communication card	External fault command is received from the communication option card.
	EF3~6	External fault from Terminal	The terminal assigned the external fault is closed.

Fault1	SVE	Zero Servo fault	The rotation position moved during Zero Servo operation.
	CE	Memobus communication Error	The communication response cannot received for 2sec.
	SE1	Sequence Error 1	See section 7 (dedicated fault message)
	SE2	Sequence Error 2	See section 7 (dedicated fault message)
	SE3	Sequence Error 3	See section 7 (dedicated fault message)
	MLC	Motor low current	See section 7 (dedicated fault message)

Fault 2 (non resetable fault)

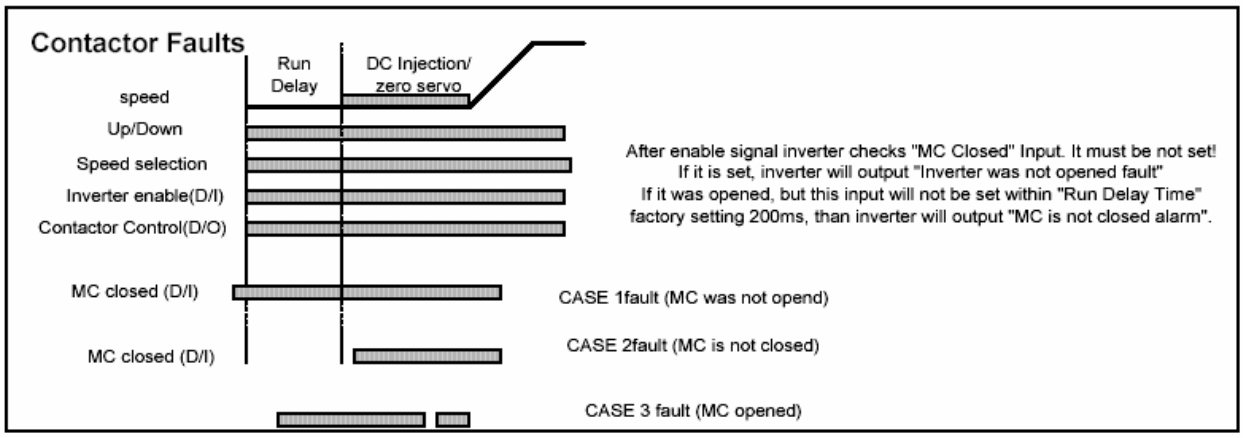
Fault2	CPF00	Main CPU down	Cannot establish the communication between inverter and the digital operator.
	CPF01	Main CPU down	After the communication established, communication error occurred between inverter and operator.
	CPF02	BaseBlock circuit error	The base block circuit in the control card has error.
	CPF03	EEPROM Error	The contents between EEPROM and RAM don't match.
	CPF04	A/D Error (CPU)	A/D error in the CPU occurs.
	CPF05	A/D Error(external)	External A/D Converter error occurs.
	CPF06	Option connection error	The option card is not connected properly.
	CPF07	ASIC RAM error	The internal RAM in the ASIC has error.
	CPF08	Watch dog timer fault	Watch dog timer counts out.
	CPF09	CPU/ASIC mutual Diagnosis fault	The mutual diagnosis between CPU and ASIC detects error.
	CPF10	ASIC version fault	ASIC version doesn't match.
	CPF20	A/D error in the option card	A/D convertion error occurs in the option card.
	CPF21	Self diagnosis error	Option card detects error during self diagnosis.
	CPF22	Model code error	Inverter doesn't recognize the option card.
	CPF23	DP-RAM Error	Communication option detects the DP-RAM error.

Special Fault commands

Contactor Feed-back Faults

(resetable Fault)

If one of the digital inputs is set for "Contactor Confirmation, there are 3 possibilities for a fault:

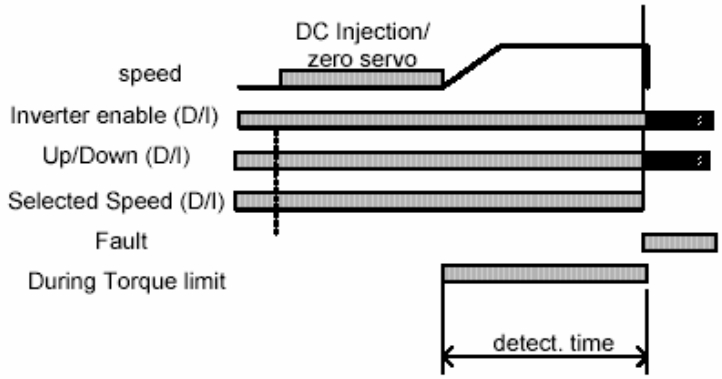

Contactor Faults
Run Delay
DC Injection/ zero servo
speed
Up/Down
Speed selection
Inverter enable(D/I)
Contactor Control(D/O)
MC closed (D/I)
MC closed (D/I)
After enable signal inverter checks "MC Closed" Input. It must be not set!
If it is set, inverter will output "Inverter was not opened fault"
If it was opened, but this input will not be set within "Run Delay Time"
factory setting 200ms, than inverter will output "MC is not closed alarm".
CASE 1fault (MC was not opend)
CASE 2fault (MC is not closed)
CASE 3 fault (MC opened)

Motor Low current Fault (MLC)

(resetable Fault)
At Brake opening and after, always when brake is opened, inverter checks the motor Current. If it is dropped below (1/4) of Motor No Load Current, this Fault will be output. FaultType 1.

Car Stacked (OL4)

After new travel command (UP, Inverter ready, reference), inverter runs at torque limit or stall prevention limit for the Stacked car detection time.



Check L6 parameters

Reference missing

At a new travel inverter got:
Inverter ready signal
Direction Signal
but no reference within 200ms (Run delay time)